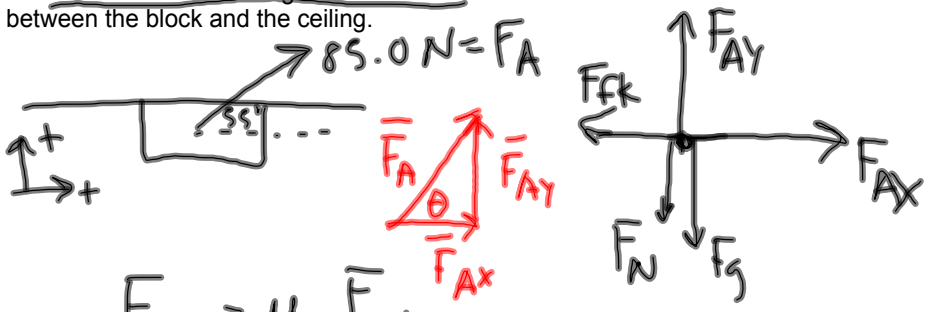
Force Practice Problems 4th Block 9.20.11

#34 p. 147: A 4.00 kg block is pushed along the ceiling with a constant applied force of 85.0 N that acts at an angle of 55 degrees with the horizontal, as in the figure. The block accelerates to the right at 6.00 m/s/s. Determine the coefficient of kinetic friction between the block and the ceiling.



$$F_{fk} = \mu_k F_N$$

$$\mu_k = \frac{F_{fk}}{F_N}$$

$$= \frac{24.8\ N}{30.4\ N}$$

$$= 0.816$$

$$\Sigma \bar{F}_x = m\bar{a}_x$$

$$F_{AX} - F_{fk} = ma_x$$

$$F_{fk} = ma_x - F_{AX}$$

$$= -ma_x + F_A \cos(55^\circ)$$

$$= 24.8\ N$$

$$\Sigma \bar{F}_y = 0$$

$$F_{AY} - F_N - F_g = 0$$

$$F_N = F_{AY} - F_g$$

$$= F_A \sin(55^\circ) - mg$$

$$= 30.4\ N$$

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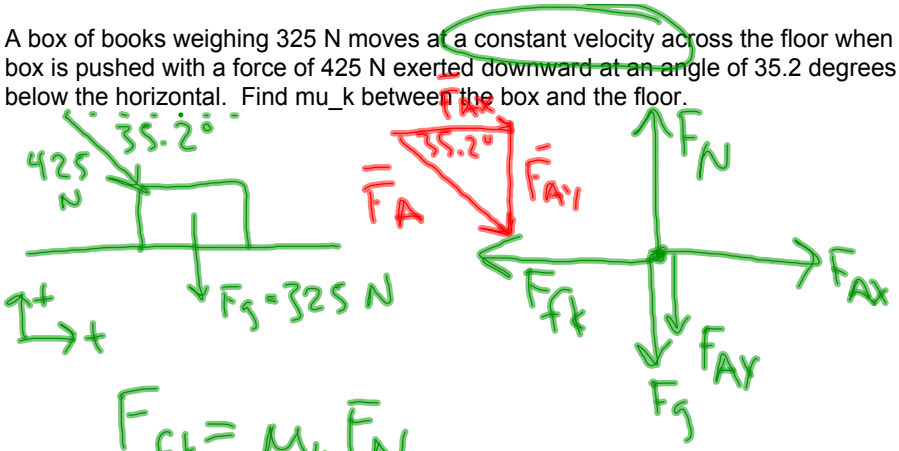
A box of books weighing 325 N moves at a constant velocity across the floor when the box is pushed with a force of 425 N exerted downward at an angle of 35.2 degrees below the horizontal. Find mu_k between the box and the floor.



$$F_{fk} = \mu_k F_N$$

$$\mu_k = \frac{F_{fk}}{F_N}$$

$$= \frac{347\ N}{570\ N}$$

$$= 0.609$$

$$\sum \vec{F}_x = 0$$

$$F_{Ax} - F_{fk} = 0$$

$$F_{fk} = F_{Ax}$$

$$= F_A \cos(35.2°)$$

$$= 347\ N$$

$$\sum \vec{F}_y = 0$$

$$F_N - F_{Ay} - F_g = 0$$

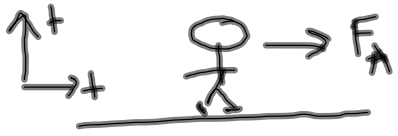
$$F_N = F_{Ay} + F_g$$

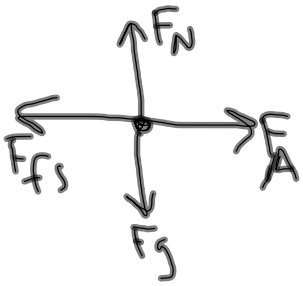
$$= F_A \sin(32.5°) + mg$$

$$= 570\ N$$

Force Practice Problems 4th Block 9.20.11

A 55 kg ice skater is at rest on a flat skating rink. A 198 N horizontal force is needed to set the skater in motion. However, after the skater is in motion, a horizontal force of 175 N keeps the skater moving at a constant velocity. Find the coefficients of static and kinetic friction between the skates and the ice.





$$F_{fs} = \mu_s F_N$$

$$\mu_s = \frac{F_{fs}}{F_N}$$

$$= \frac{198\,N}{539\,N}$$

$$= 0.37$$

$$\Sigma \bar{F}_x = 0$$

$$F_A - F_{fs} = 0$$

$$F_{fs} = F_A$$

$$= 198\,N$$

$$\Sigma \bar{F}_y = 0$$

$$F_N - F_g = 0$$

$$F_N = F_g$$

$$= 539\,N$$

for μ_k, only thing that changes is F_A going from 198 N to 175 N.

$$\therefore \mu_k = 0.32$$